7

Science Standard
7.3.e.

Student Workbook

California Education and the Environment Initiative

Responding to Environmental Change

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency
California Natural Resources Agency
Office of the Secretary of Education
California State Board of Education
California Department of Education
California Integrated Waste Management Board

Key Leadership for the Education and Environment Initiative:

Linda Adams, Secretary, California Environmental Protection Agency
Patty Zwarts, Deputy Secretary for Policy and Legislation, California Environmental Protection Agency
Andrea Lewis, Assistant Secretary for Education and Quality Programs, California Environmental Protection Agency
Mark Leary, Executive Director, California Integrated Waste Management Board
Mindy Fox, Director, Office of Education and the Environment, California Integrated Waste Management Board

Key Partners:

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Contents

Adaptation: A change in the body or behavior of a species in response to a new environmental condition. Adaptation occurs over several generations.

Adaptive characteristic: A physical or behavioral trait that allows survival in a wide range of conditions (for example, temperature, food supply, or habitat).

Consumption: The process of obtaining energy and matter from a natural system, such as by eating other organisms; the process of using goods produced by natural or human social systems; or, in the context of energy resources, the use and conversion of an energy source from one form to another.

Endangered: The legal status of a plant or animal species that is in danger of becoming extinct.

Evolution: The process by which species develop as a result of a natural selection for beneficial adaptations. Evolution occurs over many generations.

Extinct: No longer existing as a species or subspecies.

Human imprint: The combined effects of human activities on the environment over time.

Natural resources: Materials, such as water, minerals, energy, and soil, that people use from nature and natural systems.

Natural selection: The process by which individuals with advantageous variations survive and reproduce.

Nonnative species: Organisms that were not originally found in an area, but were transported there through human activity.

Nonrenewable resources: Natural resources that are finite and exhaustible, and are not naturally replenished at a rate comparable to the rate at which they are consumed by humans.

Population growth: An increase in the number of individuals of a species.

Resource conservation: The management, protection, and use of resources in a way that can meet current and future needs.

Threatened: The legal status of a plant or animal species that has a small population and may become endangered.

Urban development: The conversion of rural or natural landscapes into cities (urban areas).

Name: _____

Instructions: Use what you have learned from ***California Connections: The Coyote Success Story*** to complete the chart below.

Species: Coyote				
Adaptive Characteristics	**Effects of Adaptive Characteristics**	**Role Humans Play in the Survival of Species**	**Changes to the Environment**	**Species' Response to Change**

Name: _____

Instructions: Read the articles about the adaptive species (Canada goose and opossum). Then complete the chart below. How have human changes to the environment affected each of these species?

Species: Canada goose					Species: Opossum
Adaptive Characteristics	**Effects of Adaptive Characteristics**	**Role Humans Play in the Survival of Species**	**Changes to the Environment**	**Species' Response to Change**	

Name: _____

Instructions: Read each question and write the answers in the space provided.

1. What is an adaptation? Give one example. (2 points)

2. What is an adaptive characteristic? Give one example. (2 points)

3. What is natural selection? (1 point)

Name: _____

Instructions: Read the following description of western gulls. Explain the adaptive characteristics that allow western gulls to live in areas that have been affected by humans by completing the chart on the next page. (15 points)

Western Gull

The western gull lives along the coast of California on cliffs, beaches, harbors, islands, and bays. With its large bill and a digestive system that can digest many kinds of food, the gull can eat a varied diet. The gull floats on the surface of the water, dining on food, such as fish, squid, or sea jellies. It also eats food found on land, including small birds, eggs, and the bodies of dead animals.

Western gull populations are increasing in California, probably because their food sources have increased. The birds hover around fishing boats and enjoy scraps thrown overboard by fish cleaners. Gulls also find food from trash cans and landfills. Western gulls are intelligent and can change their behavior based on what they learn about their environment. For example, they have learned to use human-made structures, such as boats, docks, and bridges for nesting. Western gulls have also learned to be aggressive around humans, demanding food at beaches, docks, and harbors.

Name: _____

Instructions: Use information from the article about the **Western Gull** to complete the following chart. (3 points each)

Species: Western gull					
Adaptive Characteristics		**Effects of Adaptive Characteristics**	**Role Humans Play in the Survival of Species**	**Changes to the Environment**	**Species' Response to Change**

Name: _____

Instructions: Read about your animal in **Extinct Species Readings**, then complete the related row in the chart below.

Describe the Animal	When Did It Live?	Where Did It Live?	In What Kind of Environment Did It Live?	What Changes Took Place That Caused This Animal to Become Extinct?
Species: Allosaurus				
Species: Passenger Pigeon				
Species: Woolly Mammoth				

Name: _____

Instructions: Select an extinct species from the **Extinct Species Readings** and write the animal's name above the box below. Draw a picture that shows the animal and the factors that may have caused it to become extinct.

Animal: _____
Drawing (4 points)

Name: _____

Instructions: Answer the questions in the spaces provided. (3 points each)

What natural factors or environmental changes may have caused this species to go extinct?

What human factors may have caused this species to go extinct?

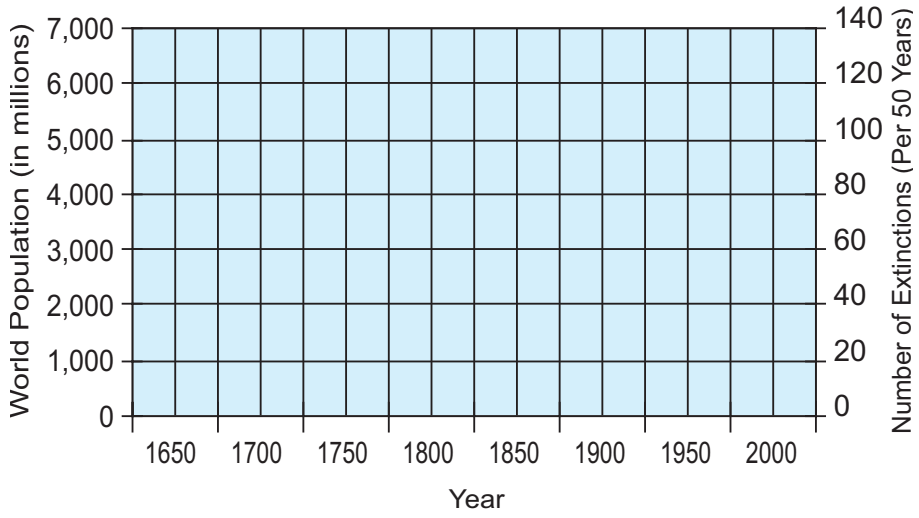
Name: _____

Instructions: Using a pencil or pen, graph world population over time. Use a different color to graph known bird and mammal extinctions over time. Note which color you use for each type of data. (8 points)

World population (pen or pencil color): _____

Known bird and mammal extinctions (pen or pencil color): _____

World Population and Known Bird and Mammal Extinctions Since 1650



Instructions: Read each question and write the answers in the spaces provided. (2 points each)

1. Over the past 350 years, when has the rate of population change been the greatest? How is this represented on the graph?

_____

_____

2. Over the past 350 years, when has the rate of extinction been the greatest? How is this represented on the graph?

_____

_____

3. Based on the shape of the curve on the graph, what do you predict will happen to the number of bird and mammal extinctions if the human population continues to grow? Why?

_____

_____

Name: _____

4. Do you think the data you used to create these graphs is completely accurate? Why or why not?

5. Do you think that human population size and extinction rates are related? How?

6. Many more people live in California now than lived here 100 years ago. How do you think this population growth has changed the state's ecosystems?

Name: _____

Instructions: With your group, answer the following question and fill in the charts based on the information from your **Resource Reading**.

Resource: _____

What is this resource used for?

_____

_____

Instructions: In the chart below, describe the different methods that people use to acquire and process this resource, and how these actions affect ecosystems. Use a new row for each method you describe.

Methods People Use to Acquire and Process this Resource	How this Activity Affects Ecosystems	How this Activity Affects Species

Name: _____

Instructions: In the chart below, describe the different ways that people consume this resource, and how consumption affects ecosystems. Use a new row for each type of consumption you describe.

Ways People Consume this Resource	How this Activity Affects Ecosystems	How this Activity Affects Species

Instructions: In the chart below, describe the different ways that people can reduce resource use. Use a new row for each conservation activity you describe.

Ways People Conserve this Resource	How this Activity Affects Ecosystems	How this Activity Affects Species

Name: _____

Instructions: For each resource studied in class, give examples of how people acquire, process, or consume the natural resource can affect ecosystems. Base your answers on your reading and your classmates' reports. (2 points each cell)

Ways People Acquire, Process, or Consume this Resource	How this Activity Affects Ecosystems	How this Action Affects Species	How Humans Can Reduce Effects on Species and Ecosystems
Resource: Crude Oil			
Resource: Coal			
Resource: Paper			
Resource: Fish			

Name: _____

Instructions: Fill in the chart below with an example from each ecosystem in the **Changes in Ecosystems** game. Use the information in the chart to answer the questions on the next page. (1 point per cell)

Ecosystem	Give an example of one human activity and why it could put a species at risk of extinction	Give an example of one human activity and why it could increase the population of a species	Describe one characteristic of the ecosystem that affects how it responds to one type of human change
Coastal Dunes			
Kelp Forest			
High Desert			

Name: _____

Instructions: Human activities have put all three of these ecosystems at risk of being destroyed. Select one of the ecosystems and use the information from the chart on the previous page to answer the questions in the space provided. (3 points each).

Ecosystem: _____

1. What kinds of things do people do to this ecosystem that alter it?

2. Some ecosystems can recover from human actions better than others once those actions are stopped or reversed. What is one thing about this ecosystem that affects how it is able to recover from human actions?

Name: _____

3. How can people change their activities to help this ecosystem survive?

Name: _____

Instructions: Read the **Species Background** to find out about each of the five species in California. Next, on the **Human Imprint** student map, locate the areas where each species lives. Use the information you find there and in the reading to fill in the chart below. (1 point per cell)

Species	**Describe the level of human change to this animal's ecosystem** *(High, Medium, Low, or Varies)*	**Do you think this species can survive despite these changes?**	**Do you think this species is at high or low risk of extinction?** *(High risk means it is endangered)*
Salt marsh harvest mouse			
Coyote			
California least tern			
Raccoon			
Fresno kangaroo rat			

Instructions: Read each question and write the answers in the space provided.

1. Look at the species you described as being at high risk of extinction. Why are these species endangered? (4 points)

_____

_____

_____

_____

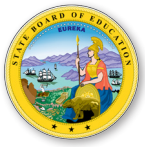
_____

Name: _____

2. Give one example of a species that you have learned about in this unit that is threatened or endangered. What kinds of environmental changes are happening to this species' ecosystem? (3 points)

3. What prevents this species from responding to these changes? (3 points)

4. If a species is at high risk of extinction, what actions can be taken to prevent this from happening? (3 points)



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